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# OSTEOLOGICAL STUDIES OF A CARNOSAURIAN DINOSAUR FROM LOWER JURASSIC KOTA FORMATION : ANDHRA PRADESH

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## SUMMARY

So far, the occurrence of carnivorous theropod dinosaur was not known from the Kota Formation. The new form designated as Dandakosaurus inducus, is described on the basis of vertebral elements of the pubis, ischium, dorsal vertebrae, candal vertebrae and isolated tooth. The tooth of Dandakosaurus had flattened and wider surface with serrations on interior side. The present genus is placed under family incerte sedis.

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## INTRODUCTION

Study of the vertebrate fauna from Upper Gondwana formations of Pranhita-Godavari valley, Adilabad district, Andhra Pradesh is a long term continuing project with aim to excavate, to identify and describe various forms. The item was continued during 1981-82 and systematic study of the skeletal parts of a carnosaurian dinosaur accrued in earlier field seasons, was carried out. The present report incorporates the studies on a carnosaurian dinosaur.

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## CARNOSAUR DINOSAURS

The suborder Theropoda (mostly flesh eating dinosaurs) consists dinosaurs of bipedal, strong hind legs, grasping hands. They existed from Triassic to cretaceous. Evolution of the theropods from Coelophysis followed along two lines of adaptation. The ancestral Coelurosaurs gave rise on the one hand to a long line of coelurosaurian evolution in which size increase was only moderate, and on the other to the carnosaurs which became giants. The carnosaurs grew into mighty hunters, relying upon their great strength and ferocity for their success in life.

One of the characteristic carnosaurs of Jurassic times is Allosaurus, known from skeletion found in the upper Jurassic sediments of North America. In Allosaurus and in other carnosaurs the bones have lost their hollow structur and have became solid. The vertebrae are heavily constructed and strongly articulated to make a very strong column.

Megalosaurus is the common European form. It is known from few incomplete skeletal parts and isolated teeth. Ceratosaurus from North America, is distinctive in that it has a small horn on the nose, the only meat eating dinosaur to be so equipped. Spinosaurus a megalosaur that lived into Late Cretaceous times in Egypt, has amazingly long vertebral spines, at times 6 feet in length.

Tyrannosaurus was the largest of all carnosaurs. The sacral attachment between pelvis and backbone is longer and stronger than in the earlier carnosaurs.

Matley (1917) discovered a variety of dinosaurs in the Lameta Group, mainly as surface finds. These were subsequently described in a monograph in 1933. Huene (1933) named two distinct forms of Carnosaurs, both close to "Allosaurids" namely Indosuchus raptorius and Indosaurus matleyi on the basis of the structure of fronto-parietal region of the skull.

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Jain et al (1962) mentioned the find of a carno in Lower Jurassic Kota sediments. The collection included a ilium and few vertebra. Jain (1980) recently stated "preser of a carnosaur was suggested earlier, but further study of the material does not confirm its presence".

As such, there is no fossil record to carnosaur from early Jurassic period in India.

## SYSTEMATIC DESCRIPTION

The skeletal parts were recovered from the excavation carried out near Yamanpalli. The material of carnosaur was recognised based on the shape and characters of pubis and ischium, heavily constructed dorsal vertebrae, caudal vertebrae and isolated teeth. The carnosaur recovere from Lower Jurassic Kota sediments is systematically descrik

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| Sub order | THEROPODA |
| Family | INCERTAE SEDIS |
| Genus | DANDAKOSAURUS gen. nov. |

Diagnosis: As for monotypic species, given below:

DANDAKOSAURUS INDICUS sp. nov.

Holotype: Proximal end of pubis (1/54Y/76)

Referred specimens: Ischium, Dorsal and caudal vertebra and isolated tooth described in the text.

Locality: 5 kms west of Yamanpalli, Adilabad district, Andh Pradesh, India

Horizon: Kota Formation, Early Jurassic.

Etymology: The forest stretch of this part is known as "Dandakaranya". The new carnosaur is named by taking the word Dandaka.

Diagnosis:

Pubes formed with expanded proximal end. The articular surface for receiving iliac process pronounced.

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The ischium slender and expanded in proximal end, the distal end is constricted and twisted a little. The dorsal vertebrae heavy, opisthicoelous type, the caudal vertebrae posse cavities on sides of the centrum and ventral surface wedge shaped. The isolated tooth flattened and curved with fine serrations on interior face.

Description:

The skeleton of Dandakosaurus indicus is incomplete but few important elements are well preserved. The evaluation of osteological characters has helped in recognising this form as carnosaur. The characters taken into account are:

1. Expanded proximal end of pubis (ii) exapnded slender proximal margin of ischium (iii) Ball and socket type articulation of dorsal vertebrae and (iv) flattened and wider surface of tooth with serrations on interior face.

The pubis is incomplete but all the margins of the bone are well preserved. The total width of the proximal end is 55 mm. The length preserved is 36 mm and width of the shaft is 21 mm.

The articular surface for receiving the iliac process is pronnunced. The length of the articular surface is 21 mm and width is 16 mm. The posterior surface takes a gentle curve. A shallow basin is formed between the shaft and posterior margin.

The ischium is nearly complete except for a small portion or distal end. The proximal end is expanded. The thickness is less. The proximal end makes three separate processes. The superior process is for receiving ischiac pedurcle of ilium, the second one is for articulation with pubis and the third one is obturator process.

The length of the ischium is 520 mm and the width in the proximal end is 200 mm. The width of the shaft is 90 mm. The distal end is somewhat twisted and constricted,

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The dorsal vertebrae are heavy in construction. The length of the centrum is 160 mm, width 230 mm and height is 230 mm. It has opisthocoelous articulation. The neural arch appears to be low. There are no procoelei on the lateral surface of the centrum. The caudal vertebrae longer than height. It possesses two lateral cavities on either side. The length of the centrum is 150 mm, width 170 mm and height is 160 mm. The caudal centra are of amphicoelous type. A number of teeth are found in association with the skeleton in the excavation pit. The carnosaurian tooth is flat and expanded transversely. The apex is broken. The tooth takes a curve towards apex. There are fine serrations on the interior surface.

Discussion:

The characters of proximal expansion of pubis, three processes in the proximal end of ischium and opisthocoelous type dorsal vertebrae with heavy constriction, the amphicoelous centra with lateral cavities and wedge shaped ventral surface and flattened serrated teeth will recognise Dandakosaurus indicus as a Carnosaurian dinosaur.

The pubis and ischium have certain similarities with Sinosaurus triassicus a large carnosaur from Upper Triassic sediments of China and Antrodemus valens of upper Jurassic age from North America. It can be differentiated from Sinosaurus with pronounced articular surface for receiving pubis peduncle of iliac and broad posterior expansion.

The articular process is present in the pubes of Antrodemus, but the posterior end is restricted.

The caudal vertebrae of Dandakasaurus differs from both the carnosaurs in having procoelous on lateral surface. The teeth large and flattened with serrations, are different.

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Two genera Indosaurus matleyi and Indosuchus raptorius are known from Upper Cretaceous Lameta beds in Central India. One of the carnosaurian tooth associated with Dandakosaurus is similar to the teeth of Indosuchus. But, other skeletal elements are fragmentary and it is not possible to carry out comparisons.

Affinity:

Any attempt to estimate the systematic position of Dandakosaurus is much encumbered by incomplete nature of the material as well as by incomplete knowledge of carnosaur evolution. The infra-order carnosauria includes 4 families- Megalosauridae, Spinosauridae, Deinocheriidae and Tyrannosauridae. Many of the carnosaur genera are of fragmentary nature, based on some isolated teeth. That is why the phylogeny and systematics of this infraorder are in a state of confusion.

The Dandakosaurus has certain similarities with Antrodemus. Antrodemus is a well known genus of Megalosaurs. The material being incomplete, the family is treated as incerte sedis for the present.

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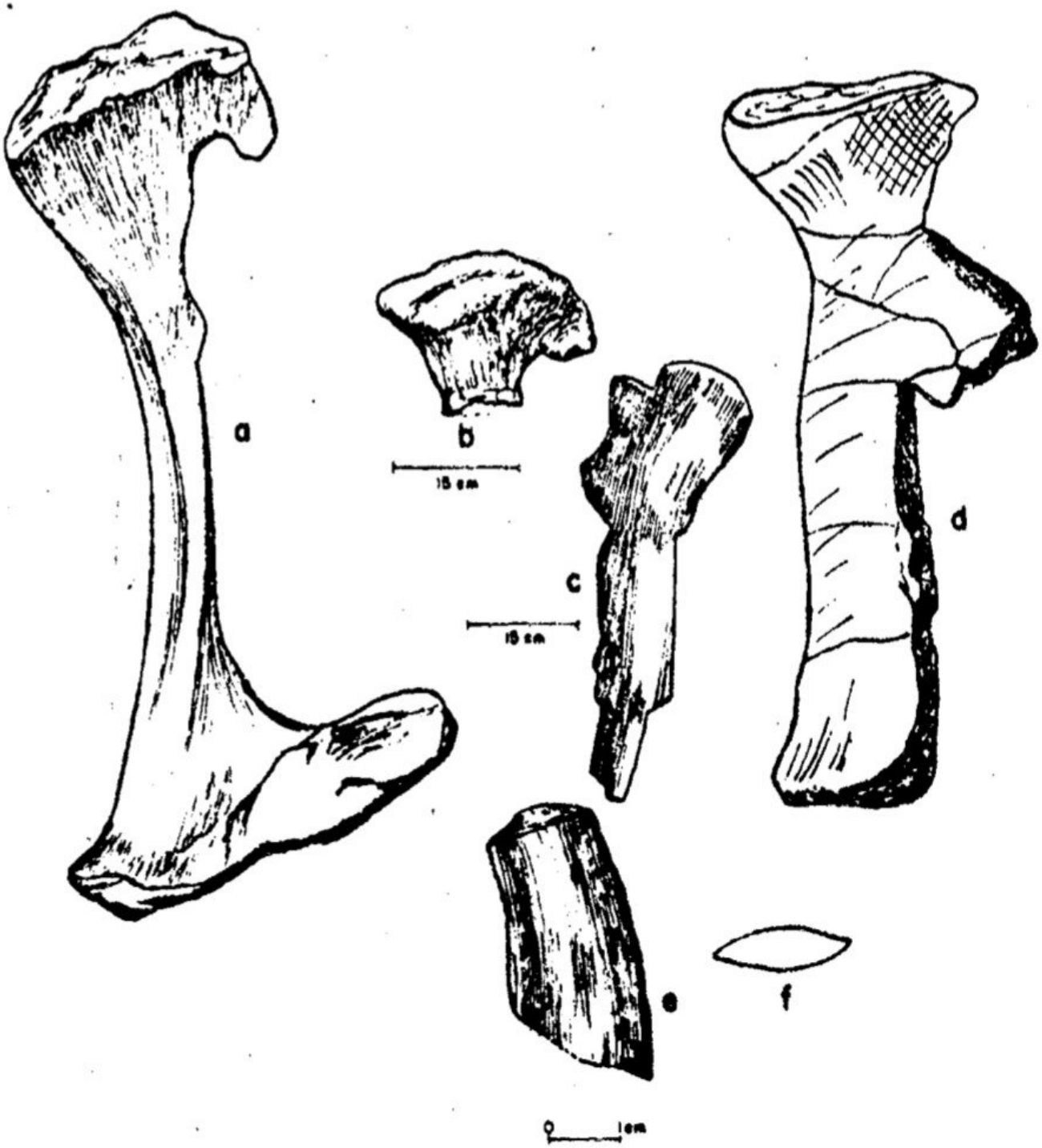
Fig. 1

Pubis (b) and Ischium (c) of Danadakosaurus compared with pubes of Antrodemus (a), Sinosaurs and tooth is shown in lateral and cross section



My interpretation of Fig. 1 is that:
a- Pubis of *Allosaurus*;
b- Pubis of *Dandakosaurus*;
c- Ischium of *Dandakosaurus*;
d- Pubis of *Sinosaurus*;
e- Tooth of *Dandakosaurus*;
f- Cross-section of crown of *Dandakosaurus*.